

What is claimed is:

1.           A multiplexing method of multiplexing  
2 communication signals from communication signal  
3 transmitting sections and transmitting a multiplexed  
4 signal to a multiplexed signal receiving section,  
5 comprising the steps of:  
6           adding, to each of the communication signals,  
7 an identification address preassigned to a predetermined  
8 signal identifying section through which a communication  
9 signal passes in a multiplexing system including the  
10 communication signal transmitting section and the  
11 multiplexed signal receiving section and outputting each  
12 of the communication signals;  
13           extracting the identification address from  
14 each output signal; and  
15           multiplexing the respective communication  
16 signals on the basis of the extracted identification  
17 addresses.

2.           A method according to claim 1, wherein the  
2 communication signal is a PPP packet created for each  
3 Internet subscriber apparatus, and the identification  
4 address is a MAC address.

3.           A demultiplexing method of receiving a  
2 multiplexed signal obtained by multiplexing a plurality

3 of communication signals from a multiplexed signal  
4 transmitting section, demultiplexing the signal into  
5 communication signals, and transmitting the  
6 demultiplexed communication signal to a communication  
7 signal receiving section, comprising the steps of:  
8 adding, to each of the communication signals,  
9 an identification address preassigned to a predetermined  
10 signal identifying section through which a communication  
11 signal passes in a multiplexing system including the  
12 multiplexed signal transmitting section and the  
13 communication signal receiving section, and outputting  
14 each of the communication signals;  
15 extracting the identification address from the  
16 output signal; and  
17 demultiplexing the multiplexed signal for each  
18 of the communication signals on the basis of the  
19 extracted identification address.

4. A method according to claim 3, wherein the  
2 communication signal is a PPP packet created for each  
3 Internet subscriber apparatus, and the identification  
4 address is a MAC address.

5. A demultiplexing method of demultiplexing a  
2 multiplexed signal obtained by multiplexing a plurality  
3 of packet into packets, comprising the steps of:  
4 extracting an IP address from each packet in

5 the received multiplexed signal; and  
6 demultiplexing the multiplexed signal into PPP  
7 packets on the basis of the extracted IP addresses.

6. A multiplexing apparatus which is connected  
2 to communication paths of communication signal  
3 transmitting sections, multiplexes communication signals  
4 from the communication paths, and transmits a  
5 multiplexed signal to a multiplexed signal receiving  
6 section through a multiplex communication path,  
7 comprising:  
8 address extracting means for extracting an  
9 identification address, for each communication signal,  
10 which is added to the communication signal received from  
11 each of the communication paths and preassigned to a  
12 predetermined signal identifying section through which  
13 the communication signal passes in a multiplexing system  
14 including the communication signal transmitting section  
15 and the multiplexed signal receiving section; and  
16 multiplexing means for multiplexing the  
17 communication signals received from the respective  
18 communication paths on the basis of the identification  
19 addresses set for the respective communication signals  
20 extracted by said address extracting means.

7. An apparatus according to claim 6, wherein  
2 the communication signal is a PPP packet created for

3 each Internet subscriber apparatus, and the  
4 identification address is a MAC address.

8. A demultiplexing apparatus which is  
2 connected to a multiplexed signal transmitting section  
3 through a multiplex communication path, demultiplexes a  
4 multiplexed signal received from the multiplex  
5 communication path, and transmits demultiplexed  
6 communication signals to a communication signal  
7 receiving section through communication paths for the  
8 respective communication signals, comprising:  
9 address extracting means, connected to the  
10 multiplex communication path, for extracting an  
11 identification address, for each of the communication  
12 signals, which is added to each of the communication  
13 signals in the multiplexed signal received from the  
14 multiplex communication path and preassigned to a  
15 predetermined signal identifying section through which a  
16 communication signal passes in a demultiplexing section  
17 including said multiplexed signal transmitting section  
18 and said communication signal receiving section; and  
19 demultiplexing means for demultiplexing the  
20 multiplexed signal into the respective communication  
21 signals on the basis of the identification addresses of  
22 the respective communication signals which are extracted  
23 by said address extracting means.

9.           An apparatus according to claim 8, wherein  
2 the communication signal is a PPP packet created for  
3 each Internet subscriber apparatus, and the  
4 identification address is a MAC address.

10.           A demultiplexing apparatus which is  
2 connected to a multiplex communication path through  
3 which a multiplexed signal obtained by multiplexing  
4 packets addressed to subscriber apparatuses is  
5 transmitted, demultiplexes the multiplexed signal  
6 received from the multiplex communication path, and  
7 outputs each demultiplexed communication signal,  
8 comprising:  
9           address extracting means, connected to the  
10 multiplex communication path, for extracting an IP  
11 address of each packet in the multiplexed signal  
12 received from the multiplex communication path; and  
13           demultiplexing means for demultiplexing the  
14 multiplexed signal into the respective packets on the  
15 basis of the IP addresses of the respective packets  
16 extracted by said address extracting means.

11.           An access network system comprising:  
2           a plurality of subscriber apparatuses which  
3 transmit/receive one of a signal having a MAC address  
4 added to a packet and a signal having no MAC address  
5 added to a packet;

6           a subscriber multiplexing/demultiplexing  
7   apparatus which multiplexes packets in signals  
8   transmitted from said respective subscriber apparatuses  
9   on the basis of MAC addresses added to the packets or IP  
10   addresses of the packets, and demultiplexes an input  
11   multiplexed signal into packets on the basis of one of a  
12   MAC address added to each packet and an IP address of  
13   each packet; and

14           a protocol termination apparatus which  
15   includes a first interface block which interfaces with a  
16   backbone network, second and third interface blocks  
17   which interface a multiplexed signal with said  
18   subscriber multiplexing/demultiplexing apparatus,  
19   switching means, and PPP processing means,

20           wherein said protocol termination apparatus  
21           when a packet in a multiplexed signal received  
22   from said subscriber multiplexing/demultiplexing  
23   apparatus through said second interface block is a data  
24   packet, said protocol termination apparatus causes said  
25   switching means to switch to transfer the data packet to  
26   said first interface block on the basis of one of a MAC  
27   address added to the data packet and an IP address of  
28   the packet, and transmits the packet to a backbone  
29   network upon converting the packet into a POS signal by  
30   using said first interface block, and  
31           when a packet in a multiplexed signal received  
32   from said subscriber multiplexing/demultiplexing

33 apparatus through said second interface block is a  
34 control packet, said protocol termination apparatus  
35 causes said switching means to switch to transfer the  
36 control packet to said PPP processing means on the basis  
37 of one of a MAC address added to the control packet and  
38 an IP address of the packet, and causes said PPP  
39 processing means to transmit the received control packet  
40 through said third interface block and perform PPP  
41 processing with said subscriber apparatus through said  
42 subscriber multiplexing/demultiplexing apparatus.

12. A system according to claim 11, wherein the  
2 packet is one of an Ethernet frame packet and an IEEE  
3 802.3 frame packet, the data packet is one of a PPP data  
4 packet in the Ethernet frame packet and a PPP data  
5 packet in the IEEE 802.3 frame, and the control packet  
6 is one of a PPP control packet in the Ethernet packet  
7 and a PPP control packet in the IEEE 802.3 frame.

13. A system according to claim 11, wherein the  
2 packet is one of a PPP packet in an Ethernet frame  
3 packet and a PPP packet in an IEEE 802.3 frame packet,  
4 the data packet is one of a PPP data packet in the  
5 Ethernet frame packet and a PPP data packet in the IEEE  
6 802.3 frame, and the control packet is one of a PPP  
7 control packet in the Ethernet packet and a PPP control  
8 packet in the IEEE 802.3 frame.

14.           An access network system comprising:

2           a plurality of subscriber apparatuses which

3   transmit/receive one of a signal having a MAC address

4   added to a packet and a signal having no MAC address

5   added to a packet;

6           a subscriber multiplexing/demultiplexing

7   apparatus which multiplexes packets in signals

8   transmitted from said respective subscriber apparatuses

9   on the basis of MAC addresses added to the packets or IP

10   addresses of the packets so as to output a multiplexed

11   signal as a POS signal, and demultiplexes an input POS

12   signal into packets on the basis of IP addresses of the

13   packets;

14           an interface which is connected to said

15   subscriber multiplexing/demultiplexing apparatus and

16   transmits a POS signal; and

17           a protocol termination apparatus which

18   includes a first interface block for interfacing with a

19   backbone network, second and third interface blocks

20   connected to said interface to interface a multiplexed

21   signal with said subscriber multiplexing/demultiplexing

22   apparatus, switching means, and PPP processing means,

23           wherein said protocol termination apparatus

24           when a packet in a multiplexed signal received

25   from said subscriber multiplexing/demultiplexing

26   apparatus through said second interface block is a data



27 packet, said protocol termination apparatus causes said  
28 switching means to switch so as to transfer the data  
29 packet to said first interface block on the basis of an  
30 IP address of the data packet, and transmits the packet  
31 to the backbone network upon converting the packet into  
32 a POS signal by using said first interface block,  
33               when a packet in a POS signal received from  
34 said subscriber multiplexing/demultiplexing apparatus  
35 through said second interface block is a control packet,  
36 said protocol termination apparatus causes said  
37 switching means to switch so as to transfer the control  
38 packet to said PPP processing means on the basis of an  
39 IP address of the control packet, and causes said PPP  
40 processing means to transmit the received control packet  
41 through said third interface block and perform first PPP  
42 processing as PPP processing between said subscriber  
43 apparatuses through said subscriber  
44 multiplexing/demultiplexing apparatus, and  
45               said protocol termination apparatus transmits  
46 a control packet through said second interface block to  
47 perform second PPP processing as PPP processing between  
48 said protocol termination apparatus and said subscriber  
49 multiplexing/demultiplexing apparatus.

15.           A system according to claim 14, wherein the  
2 packet processed by said subscriber apparatus and the  
3 packets multiplexed by said subscriber

4 multiplexing/demultiplexing apparatus are Ethernet frame  
5 packets or IEEE 802.3 frame packets, and the packets  
6 demultiplexed by said subscriber  
7 multiplexing/demultiplexing apparatus and the packet  
8 processed by said protocol termination apparatus are PPP  
9 packets in PPP packet in PPP packets in an SDH/SONET  
10 frame transmitted over a POS signal.

16. A system according to claim 14, wherein each  
2 of the packet processed by said subscriber apparatus and  
3 the packets multiplexed by said subscriber  
4 multiplexing/demultiplexing apparatus is a packet  
5 selected from the group consisting of an Ethernet packet,  
6 an IEEE 802.3 packet, and a PPP packet in the packet,  
7 and Ethernet frame packets or IEEE 802.3 frame packets,  
8 the packets demultiplexed by said subscriber  
9 multiplexing/demultiplexing apparatus and the packet  
10 processed by said protocol termination apparatus are PPP  
11 packets in PPP packet in PPP packets in an SDH/SONET  
12 frame transmitted over a POS signal.

17. A multiplexing/demultiplexing apparatus  
2 which is connected to each communication signal  
3 transmitting section, multiplexes communication signals  
4 received from said communication signal transmitting  
5 sections, transmits a multiplexed signal to a  
6 multiplexed signal receiving section, demultiplexes a

7 multiplexed signal received from said multiplexed signal  
8 transmitting section, and transmits demultiplexed  
9 communication signals to a communication signal  
10 receiving section, comprising:

11           first address extracting means for extracting  
12 an identification address, for each of the communication  
13 signals, which is added to a communication signal  
14 received from each of said communication signal  
15 transmitting sections and preassigned to a predetermined  
16 signal identifying section through which the  
17 communication signal passes in a multiplexing system  
18 including said communication signal transmitting section  
19 and said multiplexed signal receiving section;

20           multiplexing means for multiplexing the  
21 received communication signals on the basis of the  
22 identification address of each of the communication  
23 signals which is extracted by said first address  
24 extracting means, and transmitting the multiplexed  
25 signal to said multiplexed signal receiving section;

26           second address extracting means for extracting  
27 an identification address, for each of the communication  
28 signals, which is added to each of the communication  
29 signals in the multiplexed signal received from said  
30 multiplexed signal transmitting section and preassigned  
31 to a predetermined signal identifying section through  
32 which a communication signal passes in a demultiplexing  
33 system including said multiplexed signal transmitting

34 section and said communication signal receiving section;  
35 and

36 demultiplexing means for demultiplexing the  
37 multiplexed signal into the respective communication  
38 signals on the basis of the identification addresses of  
39 the respective communication signals which are extracted  
40 by said second address extracting means, and  
41 transmitting demultiplexed communication signals to said  
42 communication signal receiving section.

18. An apparatus according to claim 17, wherein  
2 the communication signal is one of an Ethernet frame  
3 packet and an IEEE 802.3 frame packet, and the  
4 identification address supplied from said first address  
5 extracting means to said multiplex means is a MAC  
6 address.

19. An apparatus according to claim 17, wherein  
2 the communication signal is a PPP packet in an Ethernet  
3 frame packet or an IEEE 802.3 frame packet, and the  
4 identification address supplied from said first address  
5 extracting means to said multiplex means is a MAC  
6 address.

20. A multiplexing/demultiplexing apparatus  
2 including first receiving means provided for each  
3 subscriber apparatus and connected to a first

4 communication path through which a packet output from  
5 said subscriber apparatus is transmitted, first  
6 transmitting means for transmitting a multiplexed signal  
7 to a first multiplex communication path, second  
8 receiving means connected to a second multiplex  
9 communication path through which a POS signal obtained  
10 by multiplexing packets addressed to said respective  
11 subscriber apparatuses is transmitted, and second  
12 transmitting means for transmitting each demultiplexed  
13 packet to a corresponding second communication path,  
14 comprising:

15 first address extracting means, connected to  
16 said first receiving means, for extracting a MAC address  
17 of each of the packets which is added to a packet  
18 received by said first receiving means;

19 multiplexing means for multiplexing the  
20 packets received by said respective first receiving  
21 means on the basis of the MAC addresses of the  
22 respective packets which are extracted by said first  
23 address extracting means, and outputting the packet;

24 second address extracting means, connected to  
25 said second receiving means, for extracting IP addresses  
26 of the respective packets from the packets in the POS  
27 signal received through said second receiving means; and

28 demultiplexing means for demultiplexing each  
29 packet in the POS signal into the packets for said  
30 respective subscriber apparatuses on the basis of the IP

31 addresses of the respective packets which are extracted  
32 by said second address extracting means, and outputting  
33 the packets to said second transmitting means.

21. An apparatus according to claim 20, wherein  
2 the packet is one of an Ethernet frame packet and an  
3 IEEE 802.3 frame packet.

22. An apparatus according to claim 20, wherein  
2 the packet is one of a PPP packet in an Ethernet frame  
3 packet and a PPP packet in an IEEE 802.3 frame packet.

23. A protocol termination apparatus including a  
2 first interface block which converts a data packet into  
3 a POS signal and transmits the signal to a backbone  
4 network, a second interface block which is connected to  
5 a subscriber multiplexing/demultiplexing apparatus to  
6 which a subscriber apparatus is connected, and receives  
7 a transmitted multiplexed signal obtained by causing  
8 said subscriber multiplexing/demultiplexing apparatus to  
9 multiplexed signals which serve to transmit packets  
10 created for the respective subscriber apparatuses and  
11 are received from the subscriber apparatuses, and a  
12 third interface block connected to said subscriber  
13 multiplexing/demultiplexing apparatus, comprising:  
14 said second interface block which extracts the  
15 packet and the MAC address added to the packet or an IP

16 address of the packet from the multiplexed signal;  
17           PPP processing means which is connected to  
18 said subscriber multiplexing/demultiplexing apparatus  
19 through said third interface block and performs PPP  
20 processing between the subscriber apparatuses through  
21 said subscriber multiplexing/demultiplexing apparatus;  
22 and  
23           switching means for, when a packet extracted  
24 by said second interface block is a data packet,  
25 transferring the data packet to said first interface  
26 block on the basis of the MAC address or the IP address  
27 of the packet which is extracted by said second  
28 interface block, and when a packet extracted by said  
29 second interface block is a control packet, transferring  
30 the control packet to said PPP processing means on the  
31 basis of one of the MAC address and the IP address of  
32 the packet which are extracted by said second interface  
33 block.

24.           An apparatus according to claim 23, wherein  
2 the packet is one of an Ethernet frame packet and an  
3 IEEE 802.3 frame packet.

25.           An apparatus according to claim 23, wherein  
2 the packet is one of a PPP packet in an Ethernet frame  
3 packet and a PPP packet in an IEEE 802.3 frame packet.

26. A protocol termination apparatus including a  
first interface block which converts a packet into a POS  
signal and transmits the signal to a backbone network, a  
second interface block which is connected, through an  
interface, to a subscriber multiplexing/demultiplexing  
apparatus to which a subscriber apparatus is connected,  
and receives a transmitted multiplexed signal obtained  
by causing said subscriber multiplexing/demultiplexing  
apparatus, which has received signals, from the  
respective subscriber apparatuses, which are used to  
transmit packets created by the respective subscriber  
apparatuses, to multiplex the packets, and a third  
interface block connected to said subscriber  
multiplexing/demultiplexing apparatus, said interface  
being a interface which transmits a POS signal,  
comprising:

said second interface block which extracts a  
packet in the POS signal and an IP address of the  
packet;

PPP processing means, connected to said  
subscriber multiplexing/demultiplexing apparatus through  
said third interface block, for transmitting a control  
packet through said third interface block to perform  
first PPP processing as PPP processing between the  
subscriber apparatuses through said subscriber  
multiplexing/demultiplexing apparatus, and transmitting  
the control packet through said third interface block to



28 perform second PPP processing as PPP processing with  
29 said subscriber multiplexing/demultiplexing apparatus;  
30 and  
31 switching means for, when a packet extracted  
32 by said second interface block is a data packet,  
33 transferring the data packet to said first interface  
34 block on the basis of the IP address extracted by said  
35 second interface block, and when a packet extracted by  
36 said second interface block is a control packet,  
37 transferring the control packet to said PPP processing  
38 means on the basis of the IP address extracted by said  
39 second interface block.

27. An apparatus according to claim 26, wherein  
2 the packet is a PPP packet in a PPP packet in PPP packet  
3 in an SDH/SONET frame transmitted over an POS signal.